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# Regional Municipality of Hamilton-Wentworth

# Dundas Water Distribution Study
# Ultimate Development

Proctor & Redfern Limited
Consulting Engineers and Planners

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# REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
# DUNDAS WATER DISTRIBUTION STUDY
# ULTIMATE DEVELOPMENT

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APRIL 1976

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## ABBREVIATIONS AND DEFINITIONS

IG - Imperial Gallons

IGPCD - Imperial Gallons per Capita per Day (1 MIGD = 694.4 IGPM)

IGPM - Imperial Gallons per Minute

M.O.E. - Ministry of the Environment

PSI - Pounds per Square Inch

TWL - Top Water Level

Average Day Consumption - The average consumption per day over a one year period.

Maximum Day Consumption - The total consumption on the maximum day in any one year.

Maximum Rate - The maximum instantaneous rate of consumption in any one year.

Firm Capacity (of pumping station) - The total installed capacity less the rated capacity of the largest pump.

## SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

### (A) Pumps

1. An additional 1100 IGPM pump in pumping station 11 is required to ensure reliable service as the Dundas population exceeds 13,000 people.
2. The construction of pumping station 11A will be required before the population of Dundas exceeds 30,000 people. Its 1990 pumping capacity should be 9.9 MIGD, 7.9 MIGD, or 15.3 MIGD respectively for the alternatives of supplying 15,000 people, zero population, or 60,000 people in the Waterdown area.
3. The capacity of pumping station 12A will require up-grading as development occurs in the west end of Dundas to a 1990 firm pumping capacity of 1,400 IGPM.
4. Pumping stations to Pressure Districts 13, 14 and 15 will be required with 1990 firm pumping capacities of 1,150 IGPM, 600 IGPM and 3,000 IGPM respectively.
5. The Greensville-Glenwood Hts. area will require a firm pumping capacity of 340 IGPM.
6. The Waterdown area will require a firm pumping capacity of 1,400 IGPM or 5,100 IGPM respectively for the alternatives of supplying 15,000 or 60,000 people.

### (B) Reservoirs

1. The capacity of reservoir 11 should be increased to 4 MIG to meet present storage requirements.

2. The proposed reservoir 11A with a capacity of 3 MIG will be required by 1990.

3. 1990 storage requirements for Pressure Districts 13, 14 and 15 are 1.6, 1.1 and 4.9 MIG respectively.

4. The Greensville-Glenwood Hts. area will require storage of 0.68 MIG.

5. The Waterdown area will require storage of 2.8 MIG or 9.9 MIG for populations of 15,000 people or 60,000 people respectively.

## (C) Watermains

1. A 12-inch diameter main is recommended between pumping station 11 and 12 along the railway right-of-way.

2. An 18-inch main is required on Hatt Street to meet fire flow requirements.

3. A 12-inch main is required on Governors Road between Creighton Road and pumping station 13.

4. A 24-inch diameter supply main from Hamilton (30-inch for the alternative of supplying a Waterdown population of 60,000 people) is required as the Dundas population exceeds 30,000 people. This main would be routed along Highway 102 and along York Road to reservoir 11A.

## 1. INTRODUCTION

The purpose of this study was to investigate the effect of future development alternatives on the adequacy of the existing Dundas Water Distribution System. Watermain layout in areas of future development was not considered, but their demands were treated as points of fixed demand at the periphery of the existing service areas. Future development areas of particular interest were given in a letter from the Regional Municipality of Hamilton-Wentworth, dated November 1st, 1974. These were:

(a) The west end of Dundas, below escarpment (400 acres)

(b) Greensville-Glenwood Hts. (1750-3500 people)

(c) east end of Dundas between the railway and escarpment (1250 acres)

(d) The Waterdown Area (15,000 people)

The three alternatives of development to be investigated are as follows:-

(a) Future demands as outlined above

(b) All areas except Waterdown serviced

(c) Waterdown area at 60,000 people

## 2. DESIGN CRITERIA

The design criteria used for this study are in compliance with the water supply policy of the Regional Municipality of Hamilton-Wentworth.

(1) Pressure in mains will be maintained at a minimum of 40 psi during max. rate consumption.

(2) Pressure in mains under combined maximum day plus fire flow will not fall below 10 psi at the point where fire flow is being withdrawn.

(3) Supply from Hamilton will generally be at a rate equal to the maximum day rate and additional flow will be drawn from storage to meet the requirement of max. rate consumption. Such reservoirs shall be elevated ground storage where possible and shall have a capacity equal to the maximum day consumption plus fire allowance.

## 3. POPULATION

The 1990 population of Dundas within the existing service area has been previously estimated at 40,000(1) and 42,809(2). In this study, the 1990 population was estimated to be marginally higher, at 45,000 people. Areas of future development have been assumed to have a density of 30 persons per acre in determining their 1990 populations. Table 1 shows the resulting populations for each area under investigation. Including new areas of development within the town limits the 1990 population for Dundas is projected to be 94,500 people.

## 4. WATER CONSUMPTION

Daily water pumping rates have been recorded at pumping station 11 since December 1966. For eight complete years of record, the maximum day consumption has ranged from 1.51 to 1.72 times average day consumption with an average value of 1.61 as seen in Table 2. These days of high consumption typically occurred during the summer months and can be attributed to lawn sprinkling. Since the residential nature of Dundas is not envisaged to change in the future, no reduction in maximum day peaking factor should occur.

For the 1990 population of Dundas, the Ministry of the Environment guidelines shown in Table 3 recommend a value of 1.65 for the maximum day peaking factor. Since this value is in agreement with the observed peaking factor for Dundas, the Ministry guidelines have been adopted for all areas as shown in Table 2. A maximum rate peaking factor of 1.5 times maximum day consumption as recommended by the M.O.E. has also been used. The average projected water consumption in the Dundas area is 70 IGPCD(3). This value was used in evaluating the 1990 consumptions for the three development alternatives as shown in Table 5.

TABLE 1

1990 POPULATIONS

| Description | Area (Acres) | Population |
|---|---|---|
| Dundas (existing developed area) | 1800 | 45,000 |
| West End of Dundas Below Escarpment | 400 | 12,000 |
| Greensville-Glenwood | - | 3,500 |
| East End of Dundas Between RR and Escarpment | 1250 | 37,500 |
| Waterdown | - | 15,000 or 60,000 |

TABLE 2

DUNDAS WATER CONSUMPTION (MIG)

| Year | Population | Total Consumption | Per Capita Consumption IGPCD | Average Day | Maximum Day | Max. Day Factor |
|---|---|---|---|---|---|---|
| 1967 | 15,461 | 358.9 | 63.6 | 0.983 | 1.528 | 1.554 |
| 1968 | 15,868 | 381.8 | 65.7 | 1.046 | 1.683 | 1.609 |
| 1969 | 16,328 | 394.8 | 66.2 | 1.082 | 1.860 | 1.719 |
| 1970 | 16,835 | 404.7 | 65.9 | 1.109 | 1.899 | 1.712 |
| 1971 | 17,100 | 443.0 | 71.0 | 1.214 | 2.008 | 1.654 |
| 1972 | 17,361 | 430.6 | 67.8 | 1.180 | 1.850 | 1.568 |
| 1973 | 18,640 | 442.1 | 65.0 | 1.211 | 1.826 | 1.508 |
| 1974 | 18,917 | 446.0 | 64.6 | 1.222 | 1.910 | 1.563 |

## TABLE 3

## M.O.E. RECOMMENDED CONSUMPTION PEAKING FACTORS

| Population Range | Max. Day Factor |
|---|---|
| 3,001 - 10,000 | 2.00 |
| 10,001 - 25,000 | 1.90 |
| 25,001 - 50,000 | 1.80 |
| 50,001 - 75,000 | 1.75 |
| 75,001 - 150,000 | 1.65 |
| greater than - 150,000 | 1.50 |

## TABLE 4

## CONSUMPTION PEAKING FACTORS

| Area | Population | Maximum Day Factor |
|---|---|---|
| Dundas | 94,500 | 1.65 |
| Waterdown Area | 60,000 | 1.75 |
| Waterdown Area | 15,000 | 1.90 |
| Greensville-Glenwood | 3,500 | 2.00 |

## TABLE 5

## 1990 SYSTEM WATER CONSUMPTION (MIGD)

| Alternative | Total Population | Average Day | Maximum Day | Maximum Rate |
|---|---|---|---|---|
| (a) | 113,000 | 7.91 | 13.41 | 20.13 |
| (b) | 98,000 | 6.86 | 11.41 | 17.14 |
| (c) | 158,000 | 11.06 | 18.76 | 28.14 |

## 5. EXISTING WATER DISTRIBUTION NETWORKS

Plate 1 shows the extent of the existing serviced area along with the location of the existing pumping stations, reservoirs and pressure districts. Water is supplied to this area from Hamilton via two mains of 16-inch and 12-inch diameter along Highway 8. Pumping station 11, which has two pumps, each rated at 1100 IGPM boosts the pressure of this supply by approximately 26 p.s.i. to the Pressure District 11 hydraulic gradient of 487 feet. Pumping stations 12 and 12A supply Pressure District 12 which operates at a hydraulic gradient of 575 feet. Currently, pumping stations 12 and 12A each have sufficient capacity to meet Pressure District 12 consumptions with 100% standby pumping capacity. Pumping station 12 has two pumps rated at 600 IGPM and 500 IGPM at 85 feet of head. Pumping station 12A has two pumps rated at 500 IGPM and 200 IGPM at 100 feet of head. Storage in Dundas consists of reservoir 11 which has a 1 MIG capacity located in Pressure District 11 and elevated tank 12 which has a capacity of 0.624 MIG located in Pressure District 12.

Watermains in the Dundas water distribution system range from 4 to 16 inches in diameter with the majority being 6-inch. Although pressures are generally adequate, certain improvements to the existing pipe network have been identified in a previous report(3). These improvements consist mainly of closing loops in the system and are recommended. With the existing pipe network and pumping facilities, a population of approximately 18,000 people can be reliably serviced at 100% pumping standby. This figure could be increased to 27,000 people by the installation of a third 1100 IGPM pump at pumping station 11 achieving an adequate 50% standby pumping capacity and is recommended. However, this additional pumping capacity will cause excessive headlosses in the two existing

12-inch diameter mains leaving pumping station 11. Therefore, the construction of a 12-inch main between pumping stations 11 and 12 along the railway right-of-way will also be required. The reduction in headloss due to this main will allow the pumps to increase their output and service a population of approximately 30,000 people. Based on the capacity of the existing trunk mains from Hamilton, a population of 35,000 poeple could be serviced by replacing the existing pumps with three pumps rated at 1400 IGPM at 65 feet of head at pumping station 11. However, this scheme is not recommended due to its low cost-effectiveness. Figure 1 visually demonstrates the analysis discussed above.

## 6. PRESSURE DISTRICTS

In order to maintain adequate pressures under normal operating conditions, five pressure districts have been proposed for the Town of Dundas, as shown in Plate 1. The projected 1990 water consumptions for each pressure district are shown in Table 6.

TABLE 6

1990 WATER CONSUMPTIONS BY PRESSURE DISTRICT (MIGD)

| Pressure District | 1990 Population | Average Day | Maximum Day | Maximum Rate |
|---|---|---|---|---|
| 11 | 42,000 | 2.940 | 4.851 | 7.277 |
| 12 | 5,000 | 0.350 | 0.578 | 0.866 |
| 13 | 10,000 | 0.700 | 1.155 | 1.733 |
| 14 | 7,000 | 0.490 | 0.809 | 1.213 |
| 15 | 30,500 | 2.135 | 3.523 | 5.284 |
| Waterdown Area | 60,000 | 4.200 | 7.350 | 11.025 |
| Waterdown Area | 15,000 | 1.050 | 1.995 | 2.993 |
| Greensville-Glenwood | 3,500 | 0.245 | 0.490 | 0.735 |

## 7. FIRE AND STORAGE REQUIREMENTS

The Insurers' Advisory Organization (formerly known as the Canadian Underwriters Association), have conducted a field inspection of the Town of Dundas and require a fire flow of 4500 IGPM for a period of 5 hours. This value is based on structure types and values and will remain applicable unless properties of greater fire loss potential are developed.

In order to meet present fire requirements, an 18-inch main along Hatt Street is recommended. In addition, the total storage within Pressure District 11 of 1.0 MIG falls short of the required 1.35 MIG of fire reserve. Present and future storage requirements based on maximum day consumption, plus fire reserve are summarized in Table 7.

### TABLE 7

### STORAGE REQUIREMENTS

| Year | Pressure District | Population | Maximum Day (MIG) | Fire Flow Required (IGPM) | Fire Duration (Hrs.) | Fire Storage (MIG) | Total Required Storage (MIG) |
|---|---|---|---|---|---|---|---|
| 1975 | 11 | 15,000 | 1.667 | 4500 | 5 | 1.350 | 3.017 |
| | 12 | 3,000 | 0.333 | 1000 | 2 | 0.120 | 0.453 |
| | Total | 18,000 | 2.000 | - | - | 1.470 | 3.470 |
| 1990 | 11 | 42,000 | 4.851 | 4500 | 5 | 1.350 | 6.201 |
| | 12 | 5,000 | 0.578 | 1000 | 2 | 0.120 | 0.582 |
| | 13 | 10,000 | 1.155 | 2603 | 3 | 0.469 | 1.624 |
| | 14 | 7,000 | 0.809 | 2189 | 2 | 0.263 | 1.072 |
| | 15 | 30,500 | 3.523 | 4435 | 5 | 1.331 | 4.854 |
| | Total | 94,500 | 10.916 | - | - | 3.533 | 14.449 |

## 8. 1990 WATER DISTRIBUTION NETWORK

The 1990 population of Dundas of 94,500 people will require the construction of a third trunk main from Hamilton along with storage totalling 14.5 MIG. The best point of connection for additional water supply is to the 20-inch watermain near Main Street and Cootes Drive. The new trunk main would be routed along Highway 102 to Dundas where the proposed pumping station 11A would boost pressures to the Pressure District 11 gradient.

The minimum recommended pipe diameter for this main is 24 inches. For the alternative of supplying 60,000 people in the Waterdown area this size should be increased to 30 inches. The firm pumping capacity of pumping station 11A along with recommended pumps are shown in Table 8 assuming a 3.5 MIGD pumping rate at pumping station 11. Figures 2 to 4 show the proposed system of supply between the pressure districts for the three development alternatives.

It should be noted that some up-grading of the Hamilton water distribution system will be required to meet the 1990 demands of the Town of Dundas.

### TABLE 8

### PUMPING STATION 11A CAPACITY

| Alternative | Waterdown Population Serviced | System Maximum Day MIG | Pumping Station 11A Firm Pumping Capacity MIGD | Recommended Pumps to Achieve 50% Standby Capacity |
|---|---|---|---|---|
| A | 15,000 | 13.4 | 9.9 | 3 x 5 MIGD |
| B | 0 | 11.4 | 7.9 | 3 x 4 MIGD |
| C | 60,000 | 18.8 | 15.3 | 3 x 8 MIGD |

## 8.1 Pressure District 11

Present storage of 1.0 MIG in reservoir 11 is inadequate to meet present and 1990 storage requirements. An addition of 3 MIG can be accommodated on the site of this existing reservoir and is recommended. In addition, proposed reservoir 11A will be required to bring the total Pressure District 11 storage to 6.2 MIG.

A 18-inch main is required along Hatt Street to meet fire fighting requirements. It is recommended that this main be extended from Market Street to the proposed 24 (or 30-inch) trunk main from Hamilton.

To supply Pressure Districts 14 and 15 as well as the Waterdown area, the proposed 24-inch (or 30-inch) trunk main from Hamilton should be extended from pumping station 11A to reservoir 11A.

## 8.2 Pressure District 12

By 1990, Pressure District 13 and Greensville-Glenwood Heights will rely on Pressure District 12 for water supply. Including the demands of these areas, the maximum day pumping requirement to Pressure District 12 will be 2.22 MIGD. To meet this maximum day consumption it is recommended that the firm pumping capacity of pumping station 12A be increased to 1400 IGPM. The addition of two pumps, each rated at 700 IGPM at 100 feet of head would achieve this firm pumping capacity with 50% standby available. Pumping station 12 at its present capacity will service the area south of Governor's Road with 100% standby pumping capacity. To accommodate the increased pumping capacity of pumping station 12A, a 12-inch main is recommended along Governor's Road between Creighton Road and the proposed pumping station 13. No additional storage will be required in Pressure District 12.

## 8.3 Pressure District 13

This pressure district is proposed to operate at a hydraulic gradient of 640 feet. Pumping station 13 will be required to increase the pressure of the supply from pumping station 12 to this gradient. Since the Greensville-Glenwood area will be supplied from pressure district 13 the total firm pumping capacity required for this pumphouse will be 1150 IGPM at approximately 75 feet of head. Three 600 IGPM pumps are recommended to obtain a 50% stand-by pumping capacity. Storage totalling 1.6 MIG will also be required within pressure district 13, preferably in the form of ground storage on top of the escarpment. Placing the storage in this location would be advantageous in that it could then be used both as pressure district 13 storage and as a bulk supply terminal for the Greensville-Glenwood area.

## 8.4 Pressure District 14

This pressure district is proposed to operate at a hydraulic gradient of 675 feet. Water supply received from pressure district 15 will require booster pumps with a firm capacity of 600 IGPM at 100 feet of head. Three 300 IGPM pumps are recommended giving a stand-by pumping capacity of 50%. Storage totalling 1.1 MIG is also required.

## 8.5 Pressure District 15

This area of potential development is proposed to operate at the same hydraulic gradient as pressure district 12 of 575 feet. Water supply would be obtained by pumping directly from the proposed reservoir 11A. A firm pumping capacity of 3000 IGPM will be required. Three 1500 IGPM pumps are recommended giving a stand-by pumping capability of 50%. Development within this pressure district

however, is not recommended until construction of the new trunk main from Hamilton is completed. The 1990 storage requirement of this district is 4.85 MIG.

## 8.6 Greensville-Glenwood

Water supply for this area would be obtained from Pressure District 13. A firm pumping capacity of 340 IGPM will be required along with 0.68 MIG of storage.

## 8.7 Waterdown Area

This area would receive water supply by pumping from the proposed reservoir 11A. The construction of the new trunk from Hamilton along with pumping station 11A and reservoir 11A must be completed before this area can be serviced. The firm pumping capacity required to service 15,000 people in this area is 1400 IGPM while for 60,000 people a firm capacity of 5100 IGPM is required. It should be noted that the existing 0.5 MIGD supply from Burlington was assumed to be terminated if water supply from Dundas was available. The Waterdown area will require storage equal to 2.78 MIG for 15,000 people or 9.90 MIG for 60,000 people.

# 9. COMPUTER ANALYSIS

To determine the adequacy of the existing Dundas water distribution system to meet the three ultimate development alternatives, the existing network model(4) was utilized. The new trunk main from Hamilton along with the proposed reservoir 11A and pumping station 11A were added to the model. This system was then subjected to a variety of 1990 system consumptions including maximum day, maximum rate, minimum demand and maximum day plus fire demand. These analyses

provided information on required trunk main sizes, pressures and reservoir filling and discharge rates. A summary of the computer runs is given in the Appendix. The 1990 water distribution system including existing and proposed mains is shown in Plate 2.

## 10. CONCLUSIONS AND RECOMMENDATIONS

### 10.1 Storage

Within Pressure District 11 of Dundas, an additional 5.2 MIG of storage will be required by 1990. An addition of 3 MIG to reservoir 11 is recommended in addition to the construction of the proposed reservoir 11A with total storage of 3 MIG. No additional storage will be required in Pressure District 12. Storage requirements for other pressure districts outside the existing service area are summarized in Table 7.

### 10.2 Watermains

Plate 2 shows both the existing water distribution system and the proposed 1990 additions to it. Beyond the local improvement mains shown, five key mains are recommended:

1. 24-inch diameter main from Hamilton [30-inch diameter for alternative (c)], to pumping station 11A along Highway 102.

2. 24-inch diameter main [30-inch diameter for alternative (c)] from pumping station 11A to reservoir 11A along York Road.

3. 18-inch diameter main from Market Street to 24-inch diameter trunk main via Hatt and Dundas Streets.

4. 12-inch main between pumping stations 11 and 12 along the railway right-of-way.

5. 12-inch main on Governors Road between Creighton Road and pumping station 13.

### 10.3 Pumping Facilities

The addition of a third 1100 IGPM pump at pumping station 11 along with the addition of two 700 IGPM pumps at pumping station 12A are recommended. In addition, pumping station 11A will be required with pumping capacity as summarized in Table 8 for the different development alternatives. Pressure Districts 13, 14, and 15 will require firm pumping capacities of 1150 IGPM, 600 IGPM, and 3000 IGPM respectively.

### 10.4 Staging

Construction of a third trunk main from Hamilton along with pumping station 11A and reservoir 11A will be required once the population of Dundas exceeds 30,000 people. It should be stressed, however, that the Waterdown area cannot be serviced nor is development recommended in Pressure Districts 14 and 15 until the construction of this main is completed. Increases in reservoir 11 storage and pumping station 11 capacity should be done as soon as funds are available. Increases in pumping station 12A capacity and the construction of pumping station 13 should occur as demand dictates.

## 10.5 Areas Outside of Dundas

### 10.5.1 Waterdown Area

Supply to the Waterdown area will be achieved by pumping directly from reservoir 11A. For a population of 15,000 people a firm pumping capacity of 1400 IGPM is required while for 60,000 people a firm pumping capacity of 5100 IGPM is required. For a population of 15,000 supplied in this area there is little effect on the 1990 Dundas water distribution system except for a required increase in firm pumping capacity of 2 MIGD at pumping station 11A. For the alternative of supplying 60,000 people in the Waterdown area, not only is there a required increase in pumping capacity at pumping station 11A of 7.3 MIGD, but the trunk main size from Hamilton to pumping station 11A and beyond to reservoir 11A must be increased in size to 30-inch diameter. Storage requirements in Waterdown for the two alternatives are 2.78 MIG or 9.90 MIG respectively.

### 10.5.2 Greensville-Glenwood Heights

A firm pumping capacity of 340 IGPM along with storage totalling 0.68 will be required to service this area. Effects of supplying this area on the Dundas water distribution system are minimal with only the firm pumping capacities of pumping stations 12A and 13 being significantly affected.

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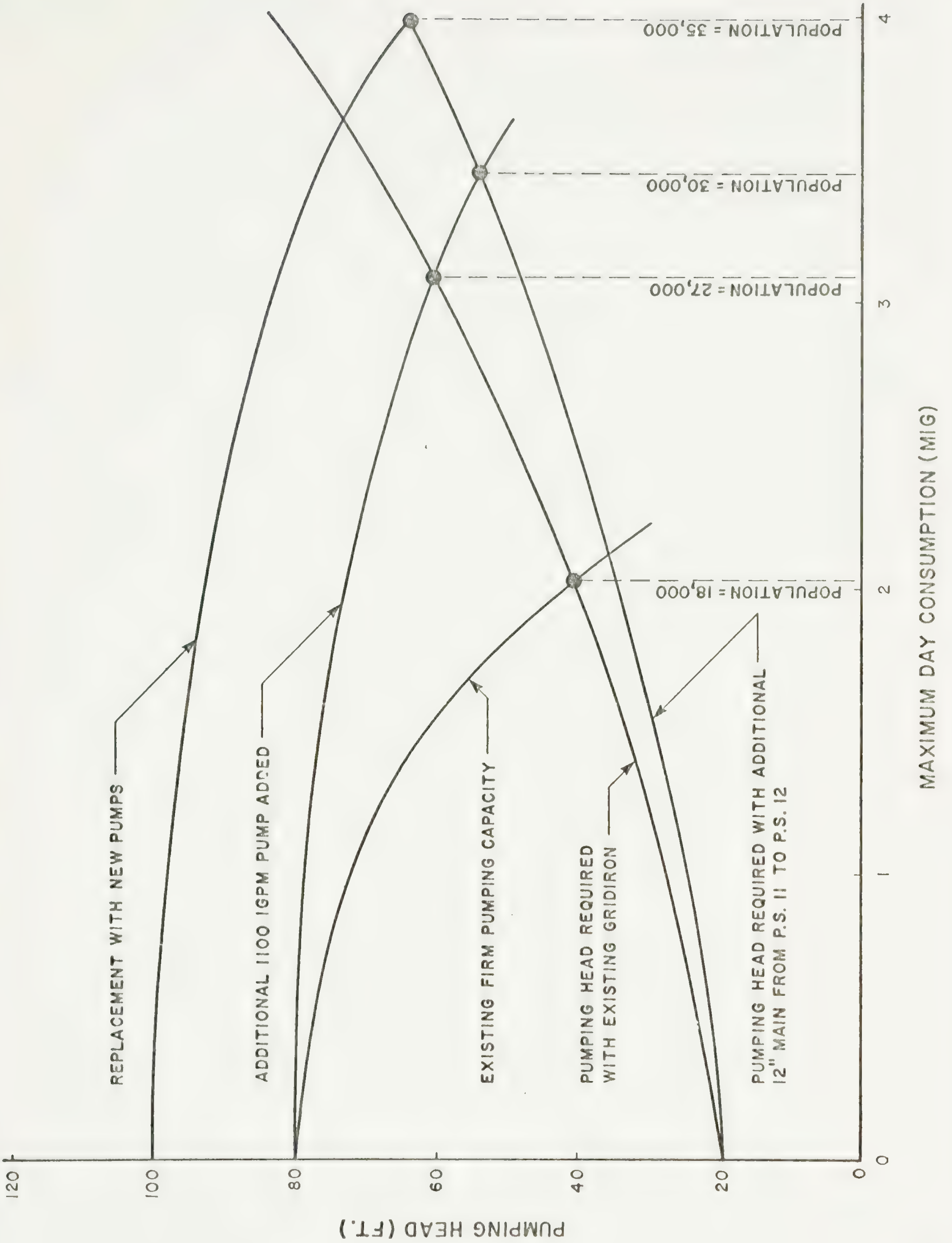
# FIGURES



REVISIONS

APPROVED BY

MUN. DEPT.

HEAD REQUIRED
VERSUS CONSUMPTION
AT PUMPING STATION II

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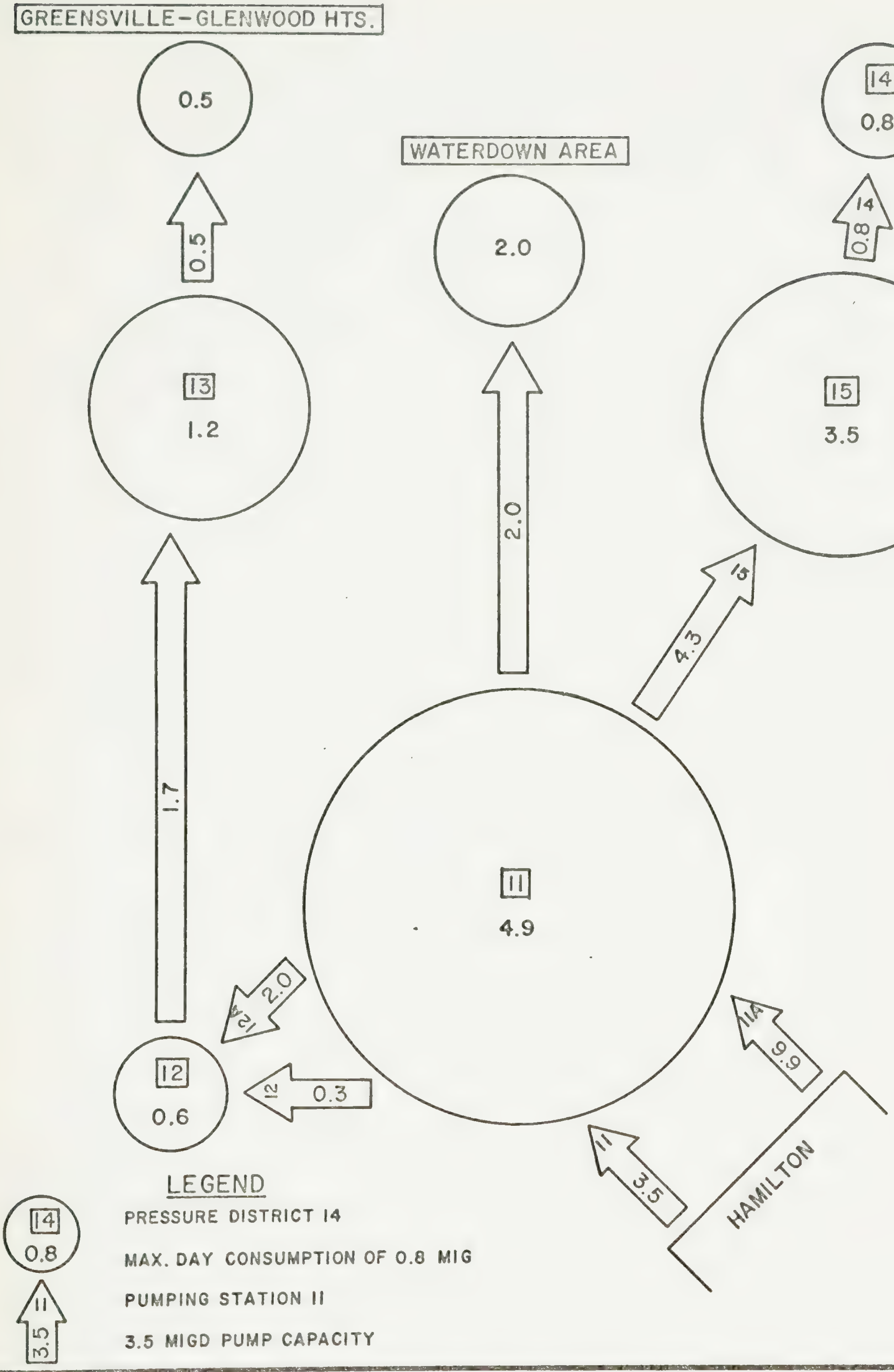
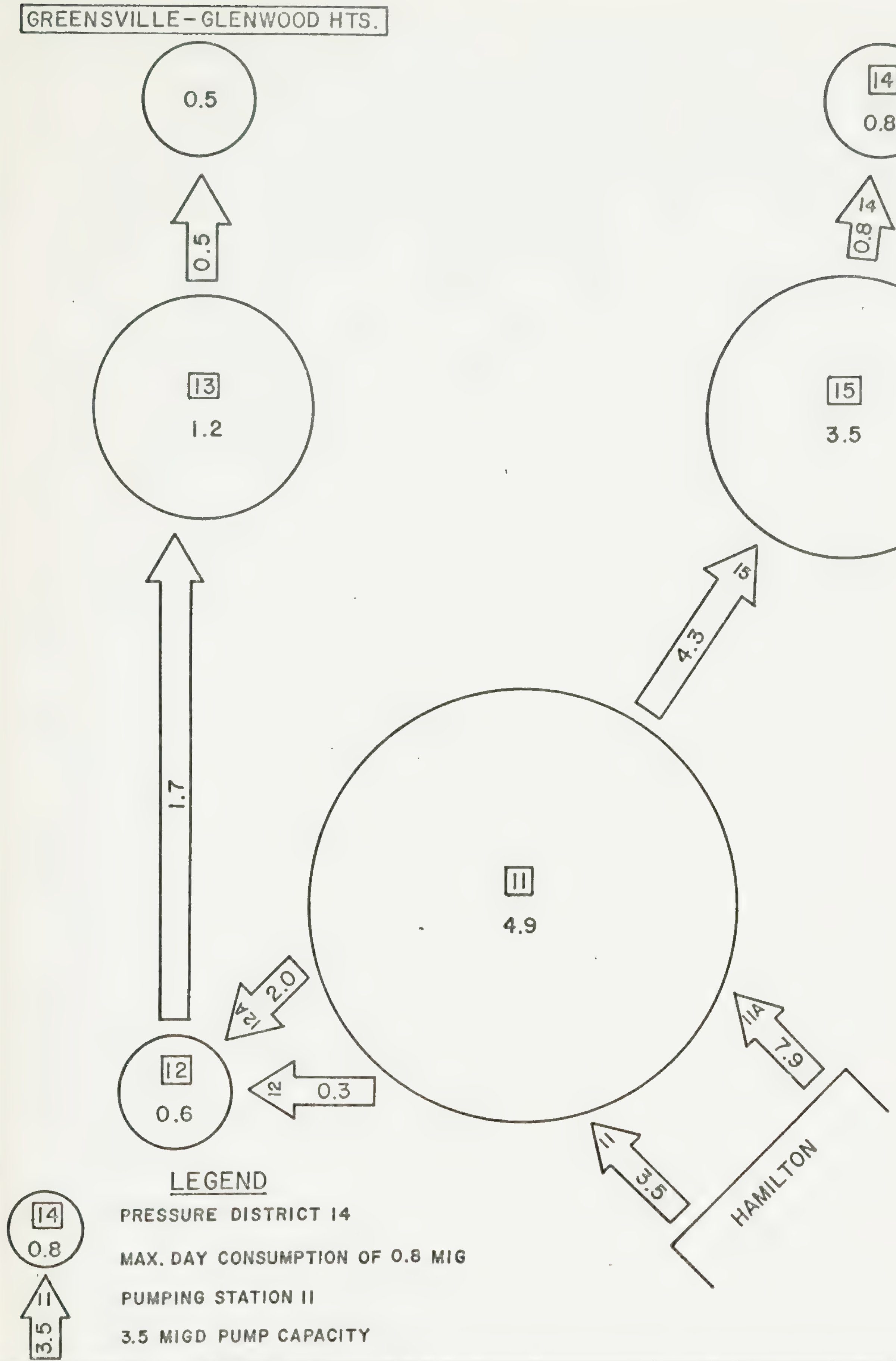
FIGURE I

REV.



| REVISIONS | | | |
|---|---|---|---|
| APPROVED BY | 1990 CONCEPTUALIZED SYSTEM<br>ALTERNATIVE 'A'<br>MAXIMUM DAY CONSUMPTION | Proctor & Redfern Limited<br>Consulting Engineers<br>Toronto | |
| MUN. DEPT. | | FIGURE 2 | REV. |



LEGEND

PRESSURE DISTRICT 14

MAX. DAY CONSUMPTION OF 0.8 MIG

PUMPING STATION 11

3.5 MIGD PUMP CAPACITY

| | |
|---|---|
| REVISIONS | |
| APPROVED BY<br>MUN. DEPT. | 1990 CONCEPTUALIZED SYSTEM<br>ALTERNATIVE 'B'<br>MAXIMUM DAY CONSUMPTION |

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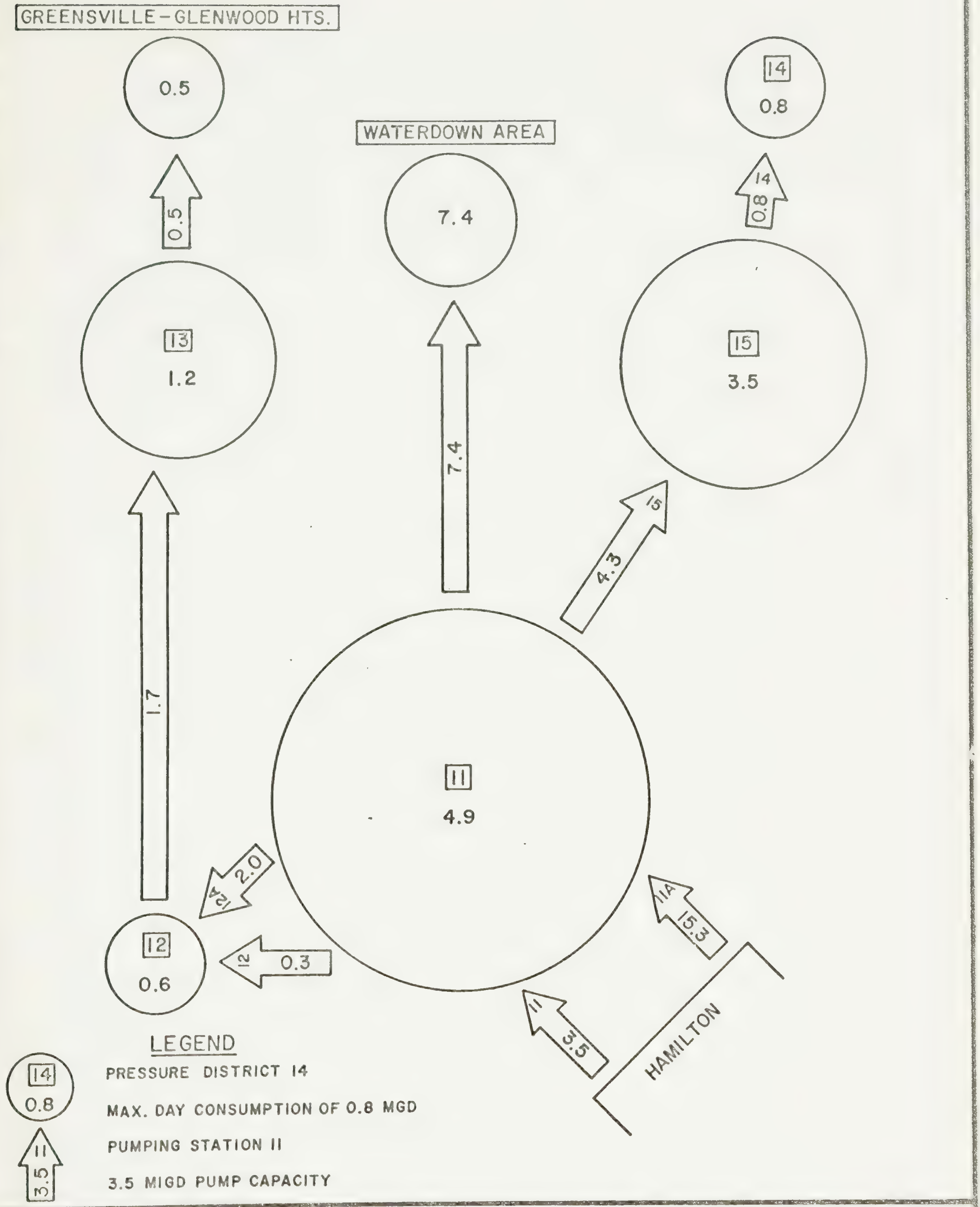
Toronto

FIGURE 3

REV.



| | |
|---|---|
| REVISIONS | |
| APPROVED BY | 1990 CONCEPTUALIZED SYSTEM<br>ALTERNATIVE 'C'<br>MAXIMUM DAY CONSUMPTION |
| MUN. DEPT. | |

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FIGURE 4

REV.

# APPENDIX

## SUMMARY OF COMPUTER RUNS

## DUNDAS WATER DISTRIBUTION STUDY - ULTIMATE DEVELOPMENT

| | Run No. | Description | Total System Demand | Hamilton Supply | Existing Reservoir 11 | Proposed Reservoir 11A | Elevated Tank 12 | Waterdown Booster | Fire Flow |
|---|---|---|---|---|---|---|---|---|---|
| Alternative A | 1 | Maximum Day | 8961 | 8961 | + 175 | - 231 | + 57 | 1038 | 0 |
| Waterdown Area | 2 | Maximum Rate | 12941 | 8961 | -1117 | -2128* | - 736** | 1038 | 0 |
| At | 3 | Max. Day + Fire | 13961 | 8961 | -2623 | -1179 | -1195 | 1038 | 5000 |
| 15000 Pop. | 4 | Minimum Demand | 5802 | 8961 | +1058 | +1139 | + 761 | 1038 | 0 |
| Alternative B | 5 | Maximum Day | 7923 | 7923 | - 89 | + 153 | - 62 | 0 | 0 |
| Waterdown Area | 6 | Maximum Rate | 11903 | 7923 | -1381 | -1758* | - 843** | 0 | 0 |
| At | 7 | Max. Day + Fire | 12923 | 7923 | -2780 | - 948 | -1271 | 0 | 5000 |
| 0 Pop. | 8 | Minimum Demand | 4764 | 7923 | + 822 | +1722 | + 614 | 0 | 0 |
| | 9 | Maximum Day | 12680 | 12680 | + 285 | - 400 | + 115 | 4757 | 0 |
| Alternative C | 10 | Maximum Rate | 16650 | 12680 | - 948 | -2362* | - 671** | 4757 | 0 |
| Waterdown Area | 11 | Max. Day + Fire | 17680 | 12680 | -2470 | -1406 | -1123 | 4757 | 5000 |
| At | 12 | Minimum Demand | 9521 | 12680 | +1123 | +1234 | + 801 | 4757 | 0 |
| 60000 Pop. | 13 | Emergency | 7923 | 3000 | -1245 | -3218* | - 458 | 0 | 0 |
| | 14 | Average Day | 7333 | 7333 | + 180 | - 263 | + 82 | 2570 | 0 |
| Pressure District 11 | 15 | Max. Day + Fire with power failure | 8369 | 0 | -4202 | -4167 | - | - | 5000 |

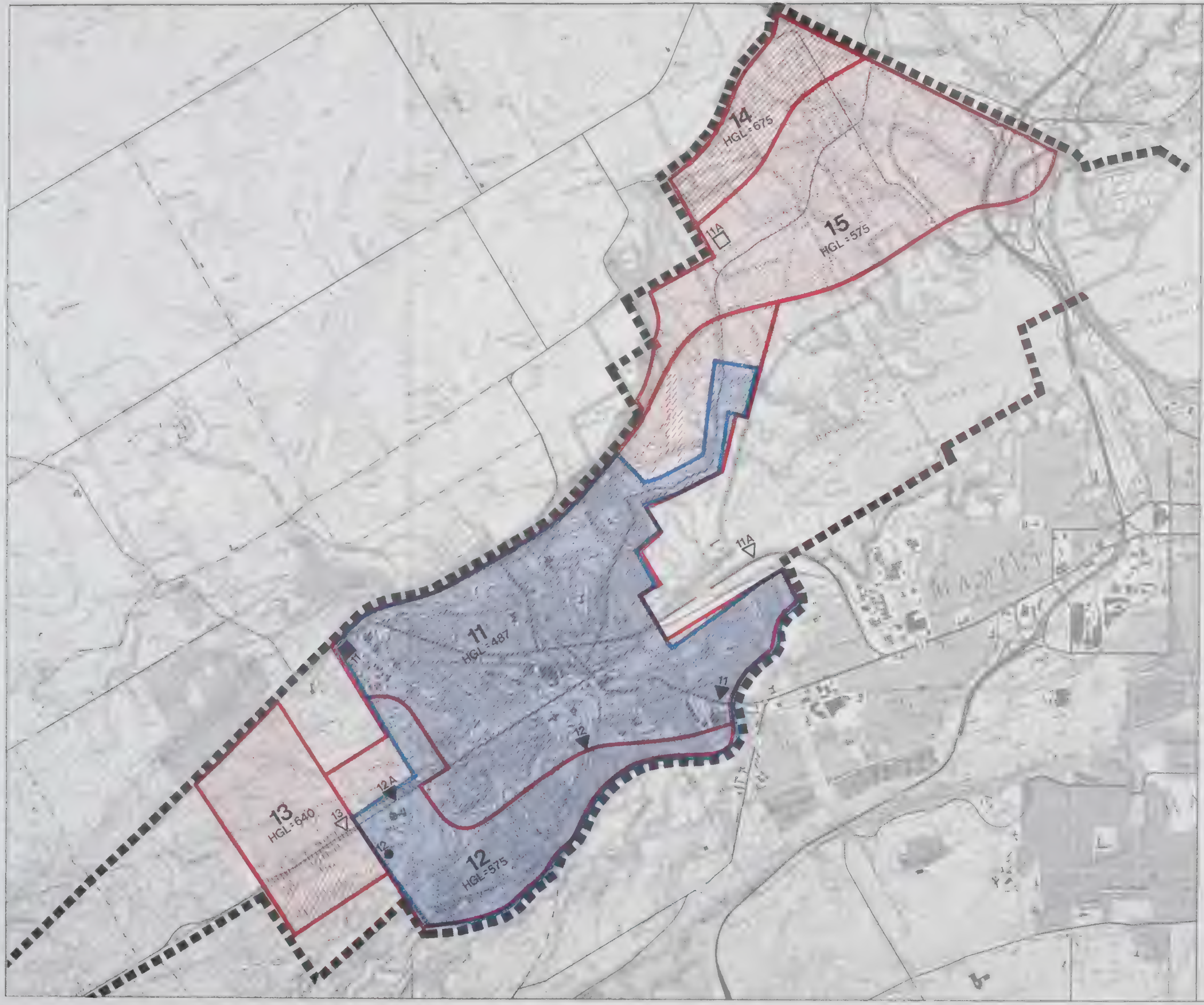
Note: All flows in IGPM. Positive reservoir flows represent storage filling rates while negative values indicate storage emptying rates.

* Includes Zone 14 and 15 supply from storage.

** Including Pressure District 13 storage.

CA3ON HW G90
76 D99

Plate 1



# Pressure Zones

## Town of Dundas

### Legend

- ▪▪▪▪▪▪ Municipal Boundary
- ▭ Existing Service Area
- ■ Reservoir
- ● Elevated Tank
- ▼ Pumping Station
- □ Proposed Reservoir
- ▽ Proposed Pumping Station

N

Scale

Proctor & Redfern Limited
Consulting Engineers
Hamilton

LOT 23
LOT 24
Proposed
Reservoir
3 MIG
TWL 487.0
103
301
(24) 30" - 1000'
301
(24) 10" - 4400'

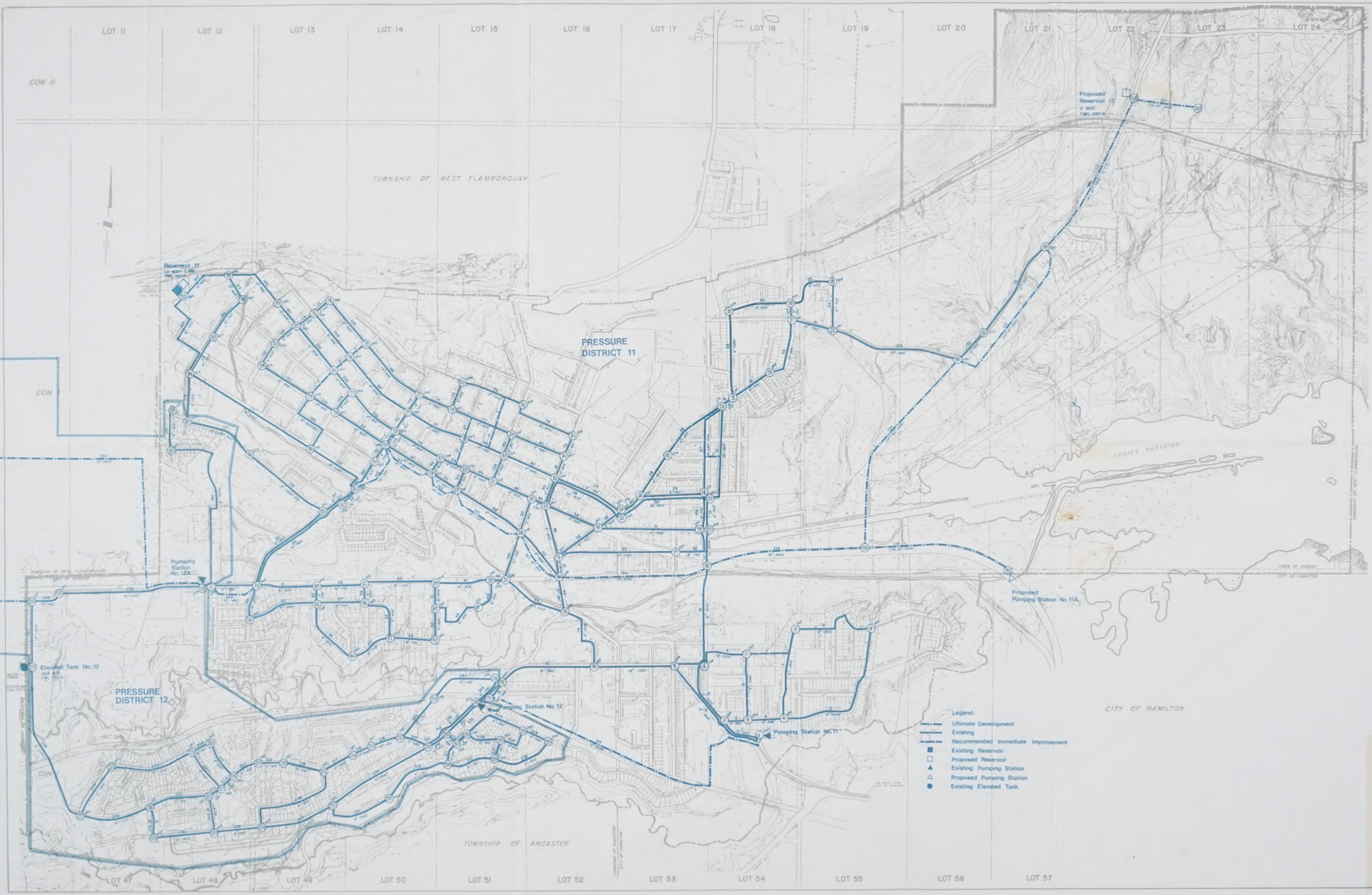


PLATE 2

CA3ONHW 090
76 D19

REGIONAL MUNICIPALITY OF
HAMILTON-WENTWORTH

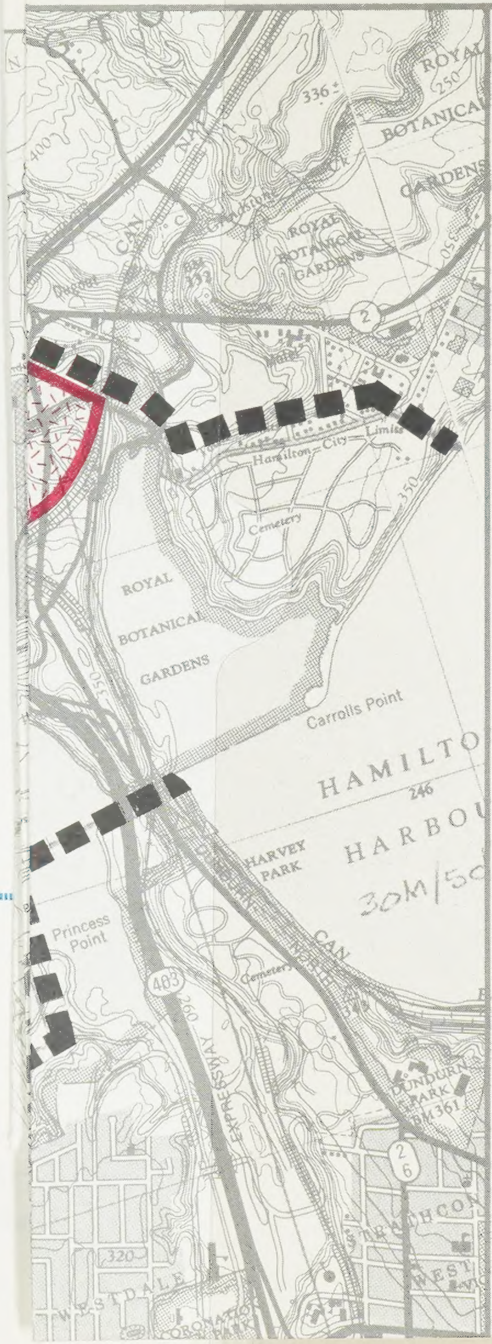
DUNDAS
WATERWORKS DISTRIBUTION SYSTEM

Proctor & Redfern Limited
Consulting Engineers
Toronto

| DRAWN BY: R.T.<br>CK'D. BY | DATE: FEB. 1976 | SCALE: 1" = 1000' |
|---|---|---|

CA3ONHW Q90
76 D99

Plate 1



# Pressure Zones

## Town of Dundas

## Legend

■■■■■■ Municipal Boundary
▭ Existing Service Area
■ Reservoir

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